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Velocity of Propagation

Velocity of Propagation for PVC Compounds, Cross Linked Polyethylene (XLPE) and Impregnated Paper (PILC) Cables for locating of faults by Pulse Reflection Measuring.

Locating of faults by Pulse Reflection Measuring

Modern measuring techniques are based on the reflection principle. Pulses that are sent out by the instrument are more or less strongly reflected at any point with impedance differing from characteristics impedance, i.e. faults, but also in joints etc. The time span between sending and return of the pulse is measured and halved.

Material and cross-sectional area of the conductor are without influence on the speed of propagation.

It is advisable to test the transit time with a sound core and to work out the speed of propagation on this basis, prior to carrying out the locating test.

The pulses are produced by a pulse generator and fed in to the cable via a special flexible conductor. Application of the reflection measuring method is fundamentally limited to faults, which cause a visible reflection.

With power cables the earth fault or short-circuit resistance should not be higher than approx. 600 Ω in order obtain accurate results It is advisable to check the fault levels beforehand, using a battery-operated test instrument.

Formula:

$$v = \frac{C}{\sqrt{\varepsilon_r}}$$

Where: υ = Speed of propagation of pulses in m/s
C = Speed of light in a vacuum (3 x 10^8 m/s)
ε_r = Dielectric constant (as per table below)

Material	ε_r
Impregnated Paper (PILC)	3.4 to 4
Polyethylene (PE)	2.4
Cross-Linked Polyethylene (XLPE)	2.4
PVC Compounds (PVC)	5 to 8

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